Imperial Bureau of Plant Genetics

(For Crops other than Herbage)

Papers on Plant Genetics

Received from January to June, 1930

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Part I. British Empire.

ORIGIN OF SPECIES, ETC. (576.16)

1. **Gregor, J. W.** **576.16: 631.521: 581.02**
Experiments on the genetics of wild populations, I. *Plantago maritima*. *J. Genetics*, 1930, **22**, pp. 15–25.
The action of the environment on a particular part of a population results in the suppression of certain types and the selection of those phenotypes most adapted to the environment. The species is the aggregate of these growth forms.

ECONOMIC PLANTS (633)

2. **Gates, R. R.** **633: 575.243: 581.035.4**
Mutations induced by X-rays. *Nature*, 1930, **126**, p. 40.
The author concludes that economic results are more probable from heterozygous plants like fruit trees than cereals where a large number of mutations are already known.

3. **Gupta, S. N.** **633–2.42: 575.24**
Studies in the genera *Cytosporina*, *Phomopsis* and *Diaporthe* II. On the occurrence of saltation in *Cytosporina* and *Diaporthe*.
Ann. Bot., 1930, **44**, pp. 349–84.
Ceaseless changes occurred in many characters including spore productivity and fertility. Saltations most frequently arose in the formation of the spores. Types conforming to other genera arose.

4. **Huskins, C. L.** **633.1: 576.356.5**
Some aspects of polyploidy in relation to the cereal crops.
Sci. Agric., 1930, **10**, pp. 313–20.
The basic chromosome number of wheat, oats, barley and rye is seven. Much of the diversity of form of present-day wheats and oats is a result of duplication of this basic number, possibly on hybridization, with production of stable polyploid forms. This accounts for the prevalence of duplicate factors, for the frequent occurrence of chromosome aberrations, and for the failure of so many observers to obtain pure lines.

5. **Percival, J.** **633.11: 576.3: 575.127**
Cytological studies of some hybrids of *Aegilops* sp. x wheats, and of some hybrids between different species of *Aegilops*.
J. Genetics, 1930, **22**, pp. 201–78.
The paper contains a detailed account of the cytology of the meiotic phase in the pollen mother cells of the following hybrids: *Aegilops ovata*, *cylindrica*, *triuncialis* and *ventricosa*, as female parents, crossed with varieties of all three groups of *Triticum*, and of the *Aegilops* species crossed among themselves.
From the results, the relationships of the different species are discussed. Pairing of the chromosomes is taken to indicate some kind of homology. Two kinds of bivalents were observed, the Parasyndetic, or side by side bivalents, and the Telosyndetic, or end to end bivalents. The first type is taken to represent the closest homology.

The hybrids of *A. cylindrica* with the *vulgare* group shewed a constant number (seven) of Parasyndetic bivalents; which is evidence that seven *Aegilops* chromosomes find their exact homologues among those of the Bread wheats. This type of pairing is completely absent when *A. cylindrica* is crossed with the Emmer group. No other species of *Aegilops* shewed the same relationship. The varying type and number of bivalents among the various hybrids is taken as indicative of their degrees of relationship.
Tri- and occasionally quadripolar spindles were observed in the heterotype division. One hybrid of *A. ovata* x *T. turgidum var. iodurum* proved to be fertile, and the F_2 possessed 56 chromosomes, so resembling Tschermak's *Aegilotricum* hybrid.
The interspecific relationships of *Aegilops* based on the cytological findings are discussed.

6. **Jenkins, J. A., and Thompson, W. P.** **633.11: 576.312.32: 575.127**
Chromosome conditions in the second and third generations of pentaploid wheat hybrids.
Can. J. Res., 1930, **2**, pp. 162–70.
Pollen mother cells of a large number of hybrids of *T. vulgare* x *T. dicoccum* and *T. durum* in F_2 and F_3 were examined for the number of bi- and univalent chromosomes. Kihara's results, that the types with the intermediate number of chromosomes tended to revert to the parent number, were confirmed, though occasional exceptions to the general rule were found.

7. **Pridham, J. T., and Dwyer, R. E.** **633.11–2.451.3 Urocystis–1.521.6**
Reaction of wheat varieties to flag smut.
Agric. Gaz., N.S.W., 1930, **41**, pp. 413–15.
Some varieties proved immune, others highly resistant. Some of the new wheats of the Department are resistant and are being tested for yield, etc., and new crosses involving resistant varieties are constantly being made.

8. **Morwood, R. B.** **633.11–2.451.3 Urocystis–1.521.6: 575**
Flag smut in wheat experiments, 1929.
Qd. Agric. J., 1930, **33**, pp. 381–88.
Certain of the Departmental crosses were more resistant than any others of the varieties tried.

9. **Newton, M., Johnson, T., and Brown, A. N.**
633.11–2.452: 576.16: 575.12
Hybridization of physiologic forms of *Puccinia graminis tritici*.
Phytopathology, 1930, **20**, pp. 112–13.
Pure forms of the rust were grown on the barberry. The nectar was used for " selfing " and " crossing " the forms. Only one was homozygous for pathogenicity. From crosses, forms different from the parents were produced, some of which were known, others unknown.

10. **Neatby, K. W., and Goulden, C. H.** **633.11–2.452–1.521.6: 575.11**
The inheritance of resistance to *Puccinia graminis tritici* in crosses between varieties of *Triticum vulgare*.
Sci. Agric., 1930, **10**, pp. 389–404.
The results of eleven crosses are given for F_2 and F_3 generations. Ratios for resistance were as follows, when *H*–44–24 was crossed with :

Reward :	One resistance factor and an inhibitor, apparently loosely linked with susceptibility.
Marquillo :	More than three factors.
Marquis-Kanred *B*2–5 :	One factor.
Double Cross :	Two factors.
Hope :	Two factors distinct from the factor in *H*–44–24.

When Hope was crossed with Reward the inhibitor for resistance was again operative. Hence two complementary factors for resistance and one inhibitor exist in all. In the cross Marquis x (Marquis-Kanred *B*2–5), the presence of more than two factors was indicated. There was no linkage of the resistance factors with awning or pubescence.

11. **Harrington, J. B.** **633.11–2.452–1.521.6: 575.116.1.061**
The relation between morphologic characters and rust resistance in a cross between *Emmer* (*Triticum dicoccum*) and common wheat (*Triticum vulgare*).
Can. J. Res., 1930, **2**, pp. 295–311.

A cross between Marquis and Vernal emmer was made in such a way as to furnish a very large F_2 population and a random sample of the whole population was taken. In addition, those plants having vulgare-like characters which were immune, were all selected from the entire population: there were 232 of these.

Fifteen morphologic characters were studied in their relation to rust resistance. With some of the characters there was a certain amount of association, but in no case was it high.

Vulgare-like plants, it was found, could possess any of the 16 characters studied which were all characteristic of *T. dicoccum*. Fertile and vigorous plants, more or less intermediate between the two, were also found. It would therefore appear that the characters which differentiate the species are not present in the seven extra chromosomes of *T. vulgare*.

There are strong indications that rust resistance was transmitted on simple Mendelian lines.

The attainment of the desired combinations of economic characters and rust resistance in the cross between these two species rests simply on working with sufficiently large populations from which to select.

12. **Ashby, E.** **633.15: 575.125: 581.1**
Studies in the inheritance of physiological characters. I. A physiological investigation of the nature of hybrid vigour in maize.
Ann. Bot., 1930, **44**, pp. 458–67.

The hybrid did not shew increased meristematic activity, the number of leaves and tillers being no larger, the cells no bigger and photosynthetic activity no greater, nor did growth continue for a longer time. The only difference was in the weight and size of the hybrid embryo, giving the plant a better start.

The growth rate is inherited from one parent as a dominant Mendelian unit character.

13. **Buckley, G. F. H.** **633.16: 575.116.6**
Inheritance in barley with special reference to the colour of Caryopsis and Lemma.
Sci. Agric., 1930, **10**, pp. 460–91.

The following is from the author's summary: A one factor inheritance was determined for the following :—two-rowed v. six-rowed (*$a^s a$*), long v. short rachilla hairs (*L.l.*), hooded v. awned (*K.k.*), hulled v. naked (*N.a.*), straight v. curved peduncle (*Cr.a.*), black v. white lemma and pericarp (*Bk.bk.*), white v. orange lemma (*Br.br.*), purple v. white lemma (*P.p.*), blue v. white aleurone (*Bl.bl.*) and normal v. albino seedling (*Albt.albt.*).

Two factor pairs (*Rt.* and *Oo.*) for red v. white pericarp exist, of which both must be present in the dominant form for the development of red pericarp. One (*Oo.*) may be necessary for the development of the gene for purple lemma. Complementary genes were found, which, together in the dominant form, inhibited the expression of the factors for red pericarp and purple lemma. Three factors (*Cc.*, *Ee.*, and *Ff.*) for the development of the purple veins of the lemma. Three linkage groups were established, *C-A-P-R*, *L-O-Br*, and *K-Bl.*

14. **Black, W.** **633.491: 575.11**
Notes on the progenies of various potato hybrids.
J. Genet., 1930, **22**, pp. 27–43.

Progeny from crosses of white-flowered parents gave coloured flowers in varying proportions, according to the Cross. Tuber colour seems to be governed by *D*, the basic colour factor, *R* giving red, *P* giving purple and *H* an incompletely dominant inhibitor. Flesh colour and tuber shape appeared to be dependent on more than one factor. The character, deep eyes, seems to be recessive in inheritance, but there is indication that it is not a single factor.

15. **Brown, C. H.** **633.51:575**
Some broader aspects of cotton breeding.
Emp. Cot. Grow. Rev., 1930, **7**, pp. 196–201.
General points for consideration.

16. **Anson, R. R.** **633.51:575(91)**
Résumé of work at the Cotton Experimental Station.
Agric. J. Fiji, 1930, **3**, pp. 11–17.
A number of varieties tested. A cotton of the Sea Island type is required, with larger bolls and higher yield of lint and resistance to Black Arm. Some selections from Sea Island x Kidney are very promising. In addition a good coarse type is being evolved.

17. **Afzal, M.** **633.51:575–18**
Studies in inheritance in cotton.
Mem. Dept. Agric. Ind. (*Bot.*), 1930, **17**, pp. 114 and 75–115.
Studies in the inheritance of leaf shape, length of petiole, shape of bracts and corolla, boll length and breadth, which was governed by several genes and gave very complicated ratios; also lint length, lint index and seed length, for the latter of which several genes and modifiers were present. Correlation was high between length of lint and of petal, and between seed index and lint index. The remaining correlations were low, shewing the possibility of combining high seed and lint index with lint length.

633.51–2.484–1.521.6(54)

18. A new cotton from the Southern Division, Bombay.
Times of India, April 4th, 1930.
A hybrid of Dharwar I and Dharwar II, named "Jayawant," possessing good lint and high wilt resisting properties.

19. **Ramanatha Ayyar, V., and Rao, C. J.** **633.51:677.21:575.22–181.2**
Variation in lint length in cotton.
Agric. J. Ind., 1930, **25**, Pt. 1, pp. 42–52.
A statistical treatment of the variation in lint length of bolls picked at different times, in locks of the same boll and in fibres in the same seed of a pure line of *G. indicum* and of *G. hirsutum*. Five readings per plant is considered a sufficient sample if bolls which burst on the same day are taken and the lint of the middle seed of the lock examined in each case.

20. **Cheesman, E. E.** **633.61(72.9)**
Cane variety problems of the West Indian Region.
Trop. Agric., 1930, **7**, pp. 96–98.
A discussion of the principles of cane breeding and points to be gained from the example of Java, the maintenance of large variety collections being one. Fundamental problems such as cytology, the constitution and correlation of yield factors, are being examined. The question of centralization of research in the British West Indies is discussed.

21. **McIntosh, A. E. S.** **633.61:575(72.9)**
Recent work in cane agriculture.
Report of the Dept. of Science and Agriculture, Barbados, 1928/29.
Int. Sug. J., 1930, **32**, pp. 350–53.
The production of new varieties of sugar cane, etc., and their comparison with the standard ones, and the study of the effects of environment and correlation studies at different stages of growth to enable selection to be practised early.
It is the aim to produce canes which will come to maturity at each of three successive seasons. Parents used for breeding were *BH*10 (12), *Ba*11569 and recent Java canes.
Both controlled and uncontrolled pollination was employed. By the latter, the value of the canes as mother plants could be ascertained. The best were *Ba*11569 and *POJ*2364. A very

large number of seedlings was raised and the value of eye selection at the age of four and a half months was established. *Ba*11569 and two of its hybrids gave the highest average weight of stools at harvest.
Seedlings for each of the three harvest periods are selected on field characters, for milling and sucrose characters and in the laboratory for node and internode characters, etc., out of 2,000 seedlings, 20 being finally selected for further trial. Weight of stool and sucrose percentage were found to be valuable characters for selection in first year plants.
Varieties differed in the time of optimum sucrose content.

22. **Deerr, N.** **633.61:575:9**
Results and object lessons from a half century of cane breeding.
Agric. J. Ind., 1930, **25**, pp. 100–3.
A brief but rather comprehensive account of the early production of sereh-resistant canes in Java, of the later production of high-yielding noble canes and later of Mosaic free canes. Also of work in Barbados, Demerara, Hawaii and India.

633.854

23. The production of Tung oil in the Empire.
Mem. Imp. Inst., Empire Marketing Board, 1930.

24. **Darlington, C. D., and Moffatt, A. A.** **634.11: 576.312.37**
Primary and secondary chromosome balance in Pyrus.
J. Genet., 1930, **22**, pp. 129–51.
The basic chromosome number is 17, but this is a secondary basic number derived and the various polyploids are secondary polyploids.

25. **Crane, M. B., and Lawrence, W. J. C.** **634.11: 581.162.5: 576.356.5: 575**
Fertility and vigour of apples in relation to chromosome number.
J. Genet., 1930, **22**, pp. 153–63.
Odd multiple polyploids as a rule are infertile. Thus the triploid apples, which includes a number of popular varieties, are of little value in practical breeding.

26. **Darlington, C. D.** **634.2: 576.16: 576.3**
Studies in Prunus III.
J. Genet., 1930, **22**, pp. 65–93.
It is shewn that in a number of crosses of different Prunus species the chromosomes are homologous and pair normally. The polyploid nature of certain species is shewn by the fact that the hybrid of a hexaploid x diploid behaves quite as a tetraploid species. A discussion on the origin of polyploids follows.

27. **Eastwood, H. W.** **634.57(94)**
The Australian Bush Nut (*Macadamia ternifolia, spp.*). An edible nut with commercial possibilities.
Agric. Gaz., N.S.W., 1930, **41**, pp. 429–30.
The nut has distinct economic possibilities. It exhibits a wide variation which makes it a suitable subject for selection. Owing to heterozygosity a good type is better retained by vegetative propagation than from seed.

634.57

28. The Macadamia nut.
Bul. Misc. Inf. (Kew), 1930, pp. 219.
Its cultivation and use is much extending. It may be propagated from seed, but seedlings are very variable. It is for this reason that vegetative propagation is being investigated in Hawaii.

29. **Jack, H. W.** **634.61–1.521.3**
Improvement of the coconut crop by selection.
Malayan Agric. J., 1930, **18**, pp. 30–39.

A very wide variation exists in the performance of individual palms, particularly important being the variation in quantity of copra produced per palm and the percentage of oil in the copra. The average production was shewn to be constant for individual palms over a period of nine years.

In a group of 471 palms, the average number of nuts produced per palm over a period of eight years was 55 nuts per annum, the average yield of copra per acre being 1,510lbs. per annum. A frequency distribution is given for number of nuts per palm per annum, and the coefficient of variability was 34%. The removal of all palms yielding less than the mean and the substitution of superior ones is regarded as profitable for young plantations. As a basis of selection, the size of the nuts and the oil content must also be considered.

Tall palms are cross-pollinated and are consequently heterozygous, but the three races of dwarf palms are comparatively pure. The green dwarf palm is the best of the three and gives a higher yield per acre than the average tall palm as it now exists. With the object of producing genetically pure high-yielding tall palms, a search is being made for some vegetative character which is associated with high yields.

Part II. Foreign.

GENETICS (575)

30. **Immer, F. R.** **575.116.1**
Formulæ and tables for calculating linkage intensities.
Genet., 1930, **15**, pp. 81–98.
The relative efficiency of various methods of calculating linkage intensities in F_2 is discussed. Coupling data are much more reliable than repulsion data, especially when close linkage is involved.

31. **Jacobj, W.** **575.116.1**
Beitrag zur Zytologie des Faktorenaustausches. (Contribution to the cytology of crossing over.)
Z. indukt. Abstamm—u. Vererb Lehre., 1930, **54**, pp. 250–56.
Description of a model shewing a mechanism of crossing over involving the Flemming ring. The amount of crossing over depends on the force of cohesion between the chromosomes and therefore, as Morgan has shewn, on the temperature.

32. **Korosy, K.** **575.116.1**
Versuch einer Theorie der Genkoppelung. (Attempt at a theory of gene coupling.)
Bibliotheca Genetica, 1930, **15**, 272 pp.

MUTATIONS (575.24)

33. **Muller, H. J., and Mott-Smith, L. M.** **575.243:581.035.4**
Evidence that natural radio-activity is inadequate to explain the frequency of " natural " mutations.
Proc. Nat. Acad. Sci., U.S.A., 1930, **16**, pp. 272–85.

CYTOLOGY (576.3)

34. **Bleier, H.** **576.3:575**
Die Bedeutung der Cytologie für die Pflanzenzüchtung. (The importance of cytology for plant breeding.)
Z. Züchtung, 1930, A. **15**, pp. 1–7.
Behaviour of the chromosomes in reduction divisions affords an explanation of Mendelian segregation; furthermore, of the irregularities of crosses between species, etc., differing in chromosome number (the cross *Triticum durum* x *T. vulgare* is described). Makes clear the folly of rejecting ill-developed seeds, which alone contain the desired combinations of chromosomes. The origin of constant hybrid forms by retention of both sets of chromosomes in the sex cells and doubling of the chromosome number, also furnishes an example. This knowledge has led to the recent attempts to produce new forms by artificial disturbance of the chromosome mechanism. Not only does this offer a possible explanation of the origin of new forms in nature (in mountainous regions subject to violent temperature changes, as Vavilov has shewn), but it affords a possible method of producing artificial variants of economic importance. Experiments of this nature are now being carried out at Wageningen.

35. **Mol, W. E. de.** **576.312.32:581.037**
Anderung der Chromosomengarnitur durch Röntgenbestrahlung und Temperaturwirkungen (Retardation und Diversität). (Alternation of the chromosome make-up by X-rays and temperature treatment.)
Z. indukt. Abstamm.—u. Vererb Lehre., 1930, **54**, pp. 363–67.
It has been shewn that abnormally low or high temperatures during the formation of sex cells will cause the production of gametes whose chromosome number is greater or less than normal in addition to diploid and tetraploid cells. Such results are also produced by X-rays. A number of such plants were examined and shewed various irregularities of chromosomes and pollen cells.

36. **Laibach, F.** **581.466:575**
Die Heterostylie und ihre Bedeutung für die Pflanzenzüchtung. (Heterostyly and its importance for plant breeding.)
Der Züchter, 1930, **2**, pp. 113–20.

Heterostyly tends to bring about crossing between different forms only. No heterostylous plant is known in which the forms differ in that character and no other. The anthers are usually of different lengths, and frequently the pollen from stamens of one length is inactive on stigmas of the other length. These are physiological differences, as shewn by crossing experiments between Linum species, of which the short stamen of the one is the same length as the long style of the other; even then the pollen was still inactive. It is essential to consider this in making crosses. In the case of many vegetatively propagated plants only the one form is in cultivation.

The divergent results of different authors may, in some cases, be the result of unsuspected heterostyly, perhaps of this physiologic nature. Certain plants may be erroneously regarded as self-sterile because no attempt has been made to choose homostylous forms.

Short style is a simple Mendelian recessive. The same factor also influences the physiologic character of the pollen which the plant produces. A number of linkages and other complications are mentioned and the origin of heterostyly is discussed.

ECONOMIC PLANTS (633)

37. **Buchinger, A.** **633–1.521.3:581.192**
Die Bedeutung der Selektion nach der Saugkraft für die Pflanzenzüchtung. (The importance of selection for osmotic pressure in plant breeding.)
Z. Züchtung, 1930, A. **15**, pp. 101–14.

Yield, hardiness, quality, etc., proves better in plants with high osmotic concentration in a large number of different crops.

38. **Hayes, H. K.** **633–4–12..521.6:575**
Inheritance of disease-resistance in plants.
Amer. Nat., 1930, **64**, pp. 15–36.

Discussion with reference to flax wilt, cabbage yellows and wheat stem rust and on new wheat varieties combining resistance to a number of diseases. Gives a good account of literature of disease resistance and a useful bibliography.

39. **Bleier, H.** **633.1:576.3:575.127**
Cytologie von Art- und Gattungsbastarden des Getreides. (The cytology of species and genus crosses in cereals.)
Der Züchter, 1930, **2**, pp. 12–22.

A review of results obtained by the various workers with wheat-rye hybrids, in which wheat-like hybrids with certain valuable rye characters have been produced. It points out the possibility of true breeding hybrids with double chromosome number appearing, and the fact that with some varieties of wheat and rye the cross is more effective than with others, which requires cytological and genetic investigation. Crossability may, therefore, be inherited on Mendelian lines. A hybridization triangle involving wheat, rye and Aegilops can be formed.

Emmer and *vulgare* crosses are described in detail and their importance in breeding for rust resistance; also *Aegilops-Triticum* hybrids and the formation of *Aegilotricum* with doubled chromosome number.

Taking the number of chromosomes which pair at the reduction division as a measure of relationship, certain groupings are suggested. *Aegilops cylindrica* is the nearest to the *emmer* group; then, in almost equal degree, *Aegilops triaristata*, *T. monococcum*, rye and *A. ovata*. This evidently agrees with Kagawa's findings on the form and size of the chromosomes.

40. **Stadler, L. J.** **633.1:581.037:575.243**
Some genetic effects of X-rays in plants.
J. Hered., 1930, **21**, pp. 3–19.

A brief account of experiments with barley and maize, in which dormant or germinating seeds were treated and self-fertilized progeny grown from each head of the resulting plants.
A number of chlorophyll mutations occurred in maize, mostly unfavourable to growth, many of them being lethal. They are transmitted to later generations as recessives. Only one mutant occurred in oats and none in wheat, probably on account of the gene re-duplication, resulting from their polyploid condition, and masking of the recessive mutants. This hypothesis is being tested by treating those species having the basic number seven.
The rate of mutation was four times as high in treating germinating seeds as in dormant seeds. In the latter the rate varied directly with the dosage. The rate was not influenced by temperature, moisture content or wave length. Mosaic endosperm occurred much more frequently when X-rays are applied at the time of fertilization.
Chromosomal irregularities and deficiencies have been noted in defective plants.
The author does not predict much practical benefit from induced mutation except in such special cases as to produce bud variations in tree fruits and such highly heterozygous plants.

41. **Pavlov, K.** **633.1–2.111**
Number, size of stomata and osmotic pressure as an aid to the estimation of wheat and oat varieties with special reference to drought resistance.
Vestnik Ceskoslov. Zemed., 1930, **6**, pp. 620–26.

No correlation was found between the number of stomata and the resistance to drought. Drought resistant sorts had a higher osmotic pressure : early varieties had a higher osmotic pressure than late.

42. **Tavčar, A.** **633.1–2.111–1.521.6:575**
Winterfestigkeit und genetisch bedingte Tieflage der Vegetationspunkte an Getreidepflanzen. (Winterhardiness and the genetically conditioned position of the growing-point of cereals below the soil surface.)
Z. Züchtung, 1930, A. **15**, pp. 63–74.

Plants unprotected by a covering of snow suffer most severely from the cold. With a temperature of the air of −21·8° C. the ground-surface temperature under the snow was −5·6° C.
The observations of previous investigators were confirmed, that the lack of light brought the growing-point of oats up to the surface, while wheat, rye and barley emerged up to the second node and it was the main growing point that suffered the greatest injury through cold. Winter-hardy plants were generally those with a deep lying growing-point.
Pure lines of wheat, barley and oats were sown, and the distance of the growing point from the soil surface was noted during March, together with the amount of damage sustained. The amount of dry matter during the period of greatest cold was investigated and the length of time to "heading." The tables shew that the growing-points of winter wheat, winter barley and winter oat varieties lie more deeply below the soil surface than the spring varieties sown in the autumn. The growing points of plants of some lines were above the soil surface, and these were less winterhardy than those whose growing points were below the level of the soil.
There seemed to be a positive correlation between cold-resistance and the duration of the vegetative period, which may be explained by the fact that the quicker growing sorts had a smaller quantity of dry matter. The growing point adjusts itself in relation to the soil surface by internodal growth and its position is modified by light and temperature. The yield from the autumn-sown spring varieties was very small owing to the damaging of the main shoot, and only certain of the side tillers headed.

43. **Raum, H.** **633.11:575 –181.13**
Ueber die Züchtung kurzhalmiger Weizensorten und die Bedeutung der Hartweizen für die Weizenzüchtung. (On the breeding of short-strawed wheat varieties and the significance of the hard wheats for wheat breeding.)
Der Züchter, 1930, **2**, pp. 120–24.

The culm length has been little influenced by breeding, though its quality has been greatly changed to produce the desirable stiff-strawed varieties. Further improvements, however, are necessary and these must lie in the direction of shorter straw.
The crossing of *compactum* with *vulgare* or *capitatum* is not successful, as with the short straw is linked the short ear and therefore a low yield results. The crossing of *vulgare* with *durum* wheats produces some varieties less than a metre high, but the sterility of the hybrids renders the results unpractical.
The value of the hard wheats is discussed, not only for crossing with *vulgare*, but for more extensive cultivation.

44. **Miczynski, K. (jun.).** **633.11:575.11**
On the inheritance of some characters in wheat in crosses of *Triticum pyramidale* x *T. durum* and *T. vulgare* x *T. sphaerococcum.*
Polish Agric. and Forest. Ann., 1930, **23**, pp. 1–36.
In the cross *T. pyramidale var. recognitum Perc.* and *T. durum var. affine* Korn. the bluish-green colour of the latter species is inherited as a recessive character on a one factor basis.
The progeny of the crosses *T. vulgare var. lutescens* (so-called awnless) x *T. sphaerococcum var. rubiginosum* (short-awned) and *T. vulgare var. erythrospermum* x *T. sphaerococcum var. rubiginosum* were investigated for the inheritance of awns. F_1 plants were slightly more awned than *vulgare* parents. The two parent-types appeared in F_2. The *vulgare* type showed awned, awnless and intermediate plants, and the *sphaerococcum* type awnless and short-awned. The ratio of awnless to awned in both types was 3 : 1. The results are explained by a second factor for ear type and by assuming a complete or nearly complete linkage between glume shape and awn type.
Grain length and glume length of F_2 plants shewed a high correlation and suggests that they are controlled by the same genetic factors.
A one factor inheritance for shattering is shown, the close-fitting glumes being dominant.

45. **Kočnar, K.** **633.11:575.12**
(Contribution to the technique of selection after hybridization.)
Vestnik Ceskoslov. A: Zemed., 1930, **6**, pp. 626–28.
Points out that the number of sterile spikelets at the base of the ear varies with the distance apart at which the plants are spaced.

46. **Aase, H. C.** **633.11:575.127:576.3**
Cytology of *Triticum*, *Secale* and *Aegilops* hybrids with reference to phylogeny.
Res. Stud. State Coll., Wash., 1930, **2**, pp. 5–60.
The following crosses were examined :
T. durum x *T. monoccum*, *T. dicoccoides* x *T. monococcum*, *Aegilops ovata* x *T. monoc.*, *T. durum* x *T. polonicum*, *T. durum* x *T. dicoccoides*, *T. vulgare* x *S. cereale*, *T. vulgare* x *T. durum*, *T. spelta* x *S. cereale*, *A. cylindrica* x *T. turgidum*, *A. cylindrica* x *T. durum*, *A. ovata* x *T. durum*, *A. ovata* x *A. cylindrica*, *A. cylindrica* x *T. vulgare*, *A. cylindrica* x *T. spelta*, *A. ovata* x *T. spelta*, *A. ovata* x *T. compactum*, *A. truncialis* x *T. vulgare.*
Chromosome conjugation was of two types : open and closed. The more open types indicate a lower degree of homology. Classifies hybrids as diploid (chromosomes bivalent), haploid (monovalent) and semi-haploid (some bi- and some monovalent). The two latter must be converted into diploids before being fertile. Premature division of haploids was often observed, which would bring about non-reduction. Complete non-reduction is possible only when almost all the chromosomes are haploid. The number of bivalents present in the various crosses were used to build up a scheme of homologies. *T. vulgare* and *Aegilops cylindrica* have one set of 7 in common, distinguishing them from other species.
Since genes are constantly changing, the close homology of these sets is taken as evidence for the recent origin of these species. Emmer evidently originated much earlier from einkorn x

another primary species, with chromosomes very different and therefore followed by non-reduction.
Aegilops ovata seems to be a true tetraploid, with a double set of the original chromosomes and hybrids of this and *A. cylindrica* show frequent cases of triploid chromosomes.

47. **Longley, A. E., and Sando, W. J.** **633.11:575.127:576.312.32**
633.14:575.127:576.312.32

Nuclear divisions in the pollen mother cells of *Triticum*, *Aegilops* and *Secale* and their hybrids.
J. Agric. Res., 1930, **40**, pp. 683–719.

T. monococcum was crossed with other wheat species and the hybrids showed a variable number of bivalents. The results indicate that there is a closer relationship between the emmer and *vulgare* groups than exists between either of them and *T. monococcum*.
In hybrids of *Aegilops* and *Triticum* pairing varies from 0–7. The behaviour of the chromosomes in the hybrid *A. crassa* x *T. dicoccoides* suggests a closer relationship between these two than between other *Aegilops* and *Triticum* species. The possible relationships between the two groups is discussed and the behaviour of hybrids between varieties of *Secale* and *Triticum* species is described.

48. **Oehler, E.** **633.11:575.242**
633.13:575.242

Speltoid- und Fatuoidmutationen. (Speltoid and fatuoid mutations.)
Der Züchter, 1930, **2**, pp. 93–101.

Describes speltoid forms and their characteristics. The original speltoids always split when propagated, splitting in varying ways which shows that, although they are phenotypically alike, their genetic constitution may be quite different.
Speltoid homozygotes occur in the progeny, having still more resemblance to *T. spelta*, shorter stems, longer and laxer ears and smaller, flinty grains. The characteristic glume characters are similar in both. Small sterile plants often appear also. There is usually a deficiency of homozygous speltoids, which are sometimes entirely lacking. The proportions of the three groups, normal, heterozygous and homozygous speltoids, is extremely variable. The latter are usually awned.
Forms resembling *T. compactum* have occasionally appeared in speltoid cultures. They are similarly heterozygous, giving complicated splitting in the progeny, which contains dwarf compactum forms, which themselves may be either constant or splitting ; also heterozygous normal forms whose splitting is exceedingly complicated.
Dwarf, semi-sterile speltoid heterozygotes and dwarf, late-ripening compactum forms occasionally appear, the homozygote of which is the so-called perennial. Chimaeras whose ears were half normal and half speltoid have appeared.
In the explanation of speltoids, Kajanus has regarded them as the result of segregation and Nilsson-Ehle as complex mutants, in which the awn factors are closely linked and so also involved. Elimination of male speltoid gametes is assumed to account for the complicated ratios, which hypothesis is substantiated by the results of reciprocal crosses of normal and speltoid heterozygotes.
Since speltoids appear in the progeny of compactums, the latter is regarded as a further complex mutation involving the speltoid.
It is supposed that, although *T. vulgare* is hexaploid, each chromosome in the homologous group of six has an appropriate one with which it pairs, giving groups arranged so :—

A B C
A B C

If an aberrant group arises, however, with the constitution :—

A B B
A B C

a speltoid results. The factor *B* is supposed to be responsible for longer ears and awns, *C* shorter

ears and no awns. Pollen grains with *ABC*, *ABB* and *Ab* are possible. Cytological evidence for this has been produced. Further, it is supposed that the two latter types of pollen grains are less viable, giving the complex ratios mentioned. Other types of speltoid have the constitution $\frac{AB}{ABC}$ (small, infertile plants) and $\frac{ABBC.}{ABC}$ Compactums may be $\frac{ACC}{ABC}$ or $\frac{AC.}{ABC}$
The fatuoid oats present a series of parallel phenomena, for which both the explanations of species crossing and mutation have been advanced. The work of Huskins suggests that they are occasioned by chromosome aberrations similar to those involved in the speltoid wheats.

49. **Muntzing, A.** **633.11:575.242:576.3**
Einige Beobachtungen über die Zytologie der Spaltoidmutanten. (Some observations on the cytology of speltoid mutants.)
Bot. Notiser, 1930, pp. 35–47.
Of 41 plants of Nilsson-Ehle's speltoid material, 18 showed lagging chromosomes and 23 normal division. The former turned out to be heterozygous speltoids (*B* and *C* type) and subcompactum; the latter, normal plants (*A* and *C* type) homozygous speltoids (*A*, *B* and *C* type), partial mutants and a heterozygous *A*-speltoid (an apparent exception). Fixed material confirmed this and also agreed with Huskin's findings: *B* heterozygotes with 41, *C* heterozygotes with 43. The subcompactums, however, had 43, not 42.
The author regards Winge's and Huskins's explanations of the speltoid phenomena as still doubtful.

50. **Philiptschenko, J.** **633.11:576.16**
Ueber die systematische Stellung des Einkorn-Weizens und nochmals über die Entwicklung der Weizenähre. (On the systematic position of the "einkorn" wheat and on the development of the ear.)
Z. indukt. Abstamm.—u. Vererb Lehre., 1930, **54**, pp. 311–18.
A comparison of the stages of development of the ear *T. monococcum*, *T. dicoccum* and *T. vulgare*, shows striking differences between *T. monococcum* and the other two groups. At first it is considerably narrower, though at the end it is as large as in *T. dicoccum* and *T. vulgare*. In the later stages it shows a very peculiar character, so that it is easily distinguished from the other wheats. It shows a surprising resemblance to that of rye and, on these grounds, the author suggests that *T. monococcum* should rank as a separate genus, *Monococcum*.
The results of the cross *T. compactum Creticum* and *T. spelta Arduini* gave four different combinations of the compactum and Spelta factors for the development of the ear.

51. **Flaksberger, C.** **633.11 spelta:576.16**
Ursprungszentrum und geographische Verbreitung des Spelzes (*Triticum spelta L.*). (Centre of origin and geographical distribution of spelt.)
Angew. Bot., 1930, **12**, pp. 86–99.
According to the author's view, *Triticum spelta* evidently originated in the Northern Alps more recently than the Stone Age, and is of a later origin than *T. vulgare*.

52. **Hakansson, A.** **633.11:576.3:575.242**
Zytologische Beobachtungen an s.g. Speltoid-heterozygoten beim Weizen. (Cytological observations on so-called speltoid heterozygotes of wheat.)
Svensk bot. Tidskr., 1930, **24**, pp. 44–57.
The reduction divisions of certain speltoid heterozygotes belonging to the *B* and *C* series are cytologically examined and the conclusion of earlier investigations is endorsed, that the segregating types are determined by a characteristic chromosome condition.

53. **Thompson, W. P.** **633.11:581.48:575.127**
Shrivelled endosperm in species crosses in wheat, its cytological causes and genetical effects.
Genet., 1930, **15**, pp. 99–113.
A consistent difference was observed in the F1 seeds of reciprocal crosses between *vulgare* and emmer wheats. The seeds are wrinkled and unhealthy when *vulgare* is the male parent, and plump when it is the female.
The F1 plants were back-crossed with both parents and the condition of the endosperm and the chromosome number of the hybrids determined. Where *vulgare* was the parent, the majority of the seeds were plump, and when the hybrid was back-crossed with, emmer the seeds were better when the pure parent was the female.
A large proportion of the wrinkled seeds failed to germinate or died at an early stage. The results of the chromosome findings were as follows :—
(1) The seeds are plump and large when the endosperm contains either :
(*a*) 3 complete or nearly complete sets of the 7 *vulgare* chromosomes ; or
(*b*) None or few of them.
(2) They are plump, but likely to be small when the endosperm contains 2 sets, complete or nearly so, or a double dose of one or two chromosomes.
(3) They are wrinkled when there is one set, complete or nearly so.
(4) The shrivelling is increased by the doubling of incomplete sets.
The condition of the endosperm of F2 of *vulgare* x *dicoccoides* agreed with the previous findings. The effect of the condition of the endosperm on the resulting plants is discussed and the importance of using as female parent the species with the larger chromosome number is pointed out.

54. **Sirodot, M.** **633.11–1.557**
Des caractères de végétation particuliers aux blés à très grands rendements. (Vegetative characters peculiar to wheats with very high yields.)
Ann. Sci. Agron., 1930, **47**, pp. 78–84.
Certain characters, such as the spreading out on the ground of the first leaves and the amount of tillering and its degree of compactness are associated by the author with high yielding wheats.

55. **Grevel, F. K.** **633.11–2.451.2:576.16:575**
Untersuchungen über das Vorhandensein biologischer Rassen des Flugbrandes des Weizens (*Ustilago tritici*). (Investigations on the existence of biologic races of wheat smut.)
Phytopath. Zeits., 1930, **2**, pp. 209–34.
Four forms are demonstrated. Two crosses of races reciprocally resistant and susceptible to forms 1 and 2 each gave segregates resistant to both forms. These are the only two forms at all prevalent in Germany.

56. **Briggs, F. N.** **633.11–2.451.3–1.521.6:575**
Inheritance of resistance to bunt, *Tilletia tritici*, in White Odessa Wheat.
J. Agric. Res., 1930, **40**, pp. 363–59.
The F2 and F3 of a White Odessa x White Federation cross were studied. The F2 results indicated a single dominant factor for resistance, which was confirmed in F3. Deviations were due to incomplete infection. It is suggested that this factor may be the same as the one in Martin whose behaviour is identical.

57. **Briggs, F. N.** **633.11–2.451.3–1.521.6;575.113.4**
Inheritance of the second factor for resistance to bunt, *Tilletia tritici*, in Hussar Wheat.
J. Agric. Res., 1930, **40**, pp. 225–32.
The second factor in Hussar, referred to in the previous paper, was isolated from the factor common to this wheat and Martin. Crosses with susceptibles show it to be a unit factor, and crosses with Martin give the same results as Hussar x susceptible. The two-factor interpretation is thus confirmed.

58. **Briggs, F. N.** **633.11–2.451.3–1.521.6:575.12**
Breeding wheats resistant to bunt by the back-cross method.
J. Amer. Soc. Agron., 1930, **22**, pp. 239–44.
Back-crossing with the desirable parent until it is identical but for bunt resistance. For a number of desirable characters as many parallel strains must first be bred. The method is also more economical.

59. **Wellensiek, S. J.** **633.11–2.452:576.16:575(49.2)**
Orientierend onderzoek omtrent physiologische specialatie van *Puccinia triticina* Eriks. in Nederland. (General investigation on physiologic specialization in *Puccinia triticina* Eriks. in Holland.)
Tijdschr. Plantenziek., 1930, pp. 1–12.
Three of the American forms were present, and the crossing of Dutch wheats with certain American ones has resulted in resistant varieties.

60. **Stakman, E. C., Levine, M. N., and Cotter, R. U.**
633.11–2.452:576.16:575.242
Hybridization and mutation in *Puccinia graminis*.
Phytopathology, 1930, **20**, p. 113.
New forms arise by hybridization on the barberry and by mutation, one of the latter having been shown to be constant.

61. **Schick, R.** **633.11:664.641.016:575**
Die Backfähigkeit der Weizen und ihre Verbesserung durch Züchtung. (The baking capacity of wheat and its improvement by breeding.)
Der Züchter, 1930, **2**, pp. 72–80.
No wheat grown in Germany can compare for baking quality with the varieties imported from Canada and U.S.A.
The author discusses the methods for determination of baking quality and comes to the conclusion that no method has been found that shows a secure relationship between the baking quality and any measurable character of wheat.
The results of Schnelle, who compared the baking qualities of German and other wheats, endorse the view that baking quality is a heritable character. The total protein content reckoned on the total nitrogen content is no certain proof of the baking quality. The presence of different proteins and the character of the gluten, such as its capacity for water absorption and its degree of elasticity are probably of great importance. The protein content is much influenced by external conditions and all authors agree that the baking quality is not equally affected. It is probable that it is the quality and not the quantity of gluten that matters and this is less affected by external conditions.
According to Schnelle, the varieties responded relatively uniformly to climatic conditions. There was no correlation of the 1,000 grain weight or the hectolitre weight with the baking quality. The correlation between baking quality, protein content and vitreous grains requires further proof.
The results of breeders in America, England, Sweden, France and Germany, in producing a high yielding wheat of good baking quality are noted and the conclusion is reached that by breeding this should eventually be possible.

62. **Emme, H.** **633.13:576.312.32**
Ueber Chromosomen von Hafer und Haferbastarden. (On the chromosomes of oats and oat hybrids.)
Der Züchter, 1930, **2**, pp. 65–68.
Oat varieties are in three groups with 7, 14 and 21 as the haploid numbers. A discussion of the relationships of the various forms and the triploid and pentaploid hybrids, their sterility and the number of bivalent chromosomes present follows. Final decisions as to the phylogeny are reserved.

63. **Mains, E. B., and Dietz, S. M.** **633.13–2.42:576.16**
Physiologic forms of barley mildew, *Erysiphe graminis hordei* Marchal.
Phytopathology, 1930, **20**, pp. 229–39.
Varieties of all species differ in reaction, many being resistant, and by using suitable varieties five physiologic forms can be distinguished. Breeding work must therefore be changed accordingly. Three varieties were found to be resistant to all five forms.

64. **Murphy, H. C., and Stanton, T. R.** **633.13–2.452–1.521.6:576.16**
Oat varieties highly resistant to crown rust. (Notes.)
J. Amer. Soc. Agron., 1930, **22**, pp. 573–74.
A variety of the name of Victoria from Argentina is immune or highly resistant to eight rust forms, and another form of *A. strigosa* from Australia is almost equally resistant. The former is expected to be of great value for breeding.

65. **Dietz, S. M., and Murphy, H. C.** **633.13–2.452–1.521.6:575**
Inheritance of resistance to *Puccinia coronata avenae, p.f.* III. (Abst.)
Phytopathology, 1930, **20**, pp. 120.
Resistance was dominant : two factors were discovered, one of which was an inhibitor of resistance, only present in one of the four crosses.

66. **Ferdinandsen, C., and Winge, O.** **633.13–2.8:575**
A heritable blotch leaf in oats.
Hereditas, 1930, **13**, pp. 164–76.
A spot necrosis of the leaf of a particular variety of oats is described and shown to be transmitted by either male or female parent, though more readily through the female. The inheritance is not on Mendelian lines although segregation occurred. The authors regard the plastids as the elements responsible for the transmission.

67. **Berg, G. F.** **633.14:575.12**
Roggenzüchtung. Freiwillige Selbstbefruchtung. (Rye breeding. Normal self-fertilization.)
Z. Züchtung, 1930, A. **15**, pp. 31–40.
The author considers that rye has an equal tendency to self- and cross-fertilization and the cultural methods have tended to select the cross-fertilized types as a result of its cultivation in extensive fields. In the process of selection the self-fertilized forms were discarded.
Four types of rye were bagged and the percentage of self-fertilization noted. The highest was in a rye which had been cultivated in the mountains with no application of breeding methods or change of seed ; *i.e.* in conditions conducive to inbreeding. The highly bred ryes were almost self-sterile.
Grains which have been formed by self-fertilization can be recognized by the remains of the stamens and stigma found in the floret, often even attached to the grain. Such a grain may be expected to transmit the tendency to self-fertilization. A large number of such grains were sown, self-fertilized again, selected and sown. Families varied very widely in the number of such grains, indicating that it may be possible to isolate self-fertilizing lines.

68. **Brewbaker, H. E.** **633.15:575.116.1**
Linkage studies with " slashed " and " glossy " of the " *BN* " linkage group in maize.
J. Agric. Res., 1930, **40**, pp. 939–50.
The character " slashed " is a striped chlorophyll deficiency of the leaves, the plant being less vigorous than normal and maturing later. It behaves as a simple recessive, certain deviations of the ratios being the result of deficiency of the double recessive. It is inherited independently of characters in all eight linkage groups except the *BN* group, in which linkages were established in F2 with a number of factors. The order of genes was shown to be *ra-gl*$_1$*sl-Bn*. The *gl*$_1$ gene also proved independent of five other linkage groups.

69. **Jenkins, M. T., and Bell, M. A.** **633.15:575.116.1.061.6**
The inheritance, interactions and linkage relations of genes causing yellow seedlings in maize.
Genet., 1930, **15**, pp. 253–82.
The inheritance and linkage relations are reported of two new genes, l_3 and l_4, for production of yellow pigment, both lethal, simple recessives, which have been shown to differ from each other and from the original l_1 and l_2, as the result of a large number of linkage calculations, which enabled the following chromosome map to be compiled involving the second of the two : L_4-R-W_3-L_2. This arrangement, and the respective distances, was supported by a number of different crossing-over percentages.

70. **Emerson, R. A., and Beadle, G. W.** **633.15:575.127:576.356.5**
A fertile tetraploid hybrid between *Euchlaena perennis* and *Zea mays*.
Amer. Nat., 1930, **64**, pp. 190–93.
A plant found in F_1 of teosinte x maize having the double number of maize chromosomes.

71. **Hauge, S. M.** **633.15:577.16:575**
An inheritance study of the distribution of vitamin A in maize. II. Vitamin A in hybrid red maize.
J. Biol. Chem., 1930, **86**, pp. 161–65.
Grains from a hybrid, segregating ear were tested for vitamin A. The grains with yellow endosperm contained the vitamin, but the white grains were devoid of it. There was no association between pericarp colour and vitamin content.

72. **Hauge, S. M., and Trost, J. F.** **633.15:577.16:575**
An inheritance study of the distribution of vitamin A in maize. III. Vitamin A content in relation to yellow endosperm.
J. Biol. Chem., 1930, **86**, pp. 167–72.
It is shown that vitamin A content is conditioned by genetic factors and that these factors are the same as those controlling the yellow endosperm colour.

73. **Burnham, C. R.** **633.15:581.162.5**
Genetical and cytological studies of semi-sterility and related phenomena in maize.
Proc. Nat. Acad. Sci., U.S.A., 1930, **16**, pp. 269–77.

74. **Jenkins, M. T.** **633.15:581.43:575.11**
Heritable characters of maize. XXXIV. Rootless.
J. Hered., 1930, **21**, pp. 79–80.
Plants described having the same number of seminal roots but defective development of cross roots. The character is governed by a simple Mendelian recessive, and it is claimed that this is the first root character to be examined genetically.

75. **Wentz, J. B.** **633.15:581.48:575.116.4**
The inheritance of germless seeds in maize.
Agric. Exp. Sta. Iowa State Coll. Agric. and Mechan. Arts Res. Bull., **121**, 1930.
Two strains carrying a factor for germless seeds were crossed together : the F_1 showed no germless seeds, showing that the two factors were different.
Linkage relations have been established for the characters in Group II. The fact that linkage of one of the factors was shown with *R* and not with *G* or *Pg*, was taken to indicate that its position was at the other side of *R*, giving the possibility of 50% crossing-over with these two. The other of the two factors is not linked with any of these or with *Pr*. *Pr* is not linked with *R* or *G*. Crossing-over percentages for *R* with *G* and Pg_1 are in accordance with those previously reported by other observers.

76. **Kuckuck, Hermann** **633.16:575"793"**
Die Entstehung von Wintertypen nach Kreuzung von Sommertypen bei Gerste. (The origin of winter types by crossing summer types in barley.)
Z. indukt. Abstamm.—u. Vererb Lehre., 1930, **53**, pp. 1–25.

Two summer barleys were crossed and the F1 in the young stages were bushy. Two types differing in habit could be distinguished among the F2 plants at flowering time, though all flowered. The ratios indicated a two factor difference, the winter type (*di*) being the double recessive, but later results did not bear this out.

Among the 78 F3 families, 40 were homozygous for the summer type (*Di*), two were homozygous winter type (*di*), and the rest segregated into *Di* and *di*. The length of the vegetative period was found to be a heritable quality. The early flowering plants were homozygous for earliness, those flowering later segregating in increasing numbers.

When the plants were arranged according to the flowering time of their parents, they separated into two sharply defined groups. Among the second of these, six groups could be distinguished, which ranged in growing habit during their younger stages, from creeping to the normal upright summer type. The habit was not a constant character and the plants that in one stage belonged to one group, in a later stage could be classified under another group. No correlation could be established between the habit in the young stages and the length of the vegetative period.

Three factor pairs are assumed for the length of the vegetative period, which work quantitatively. Those plants with less than two factors changed their habit to become *di* plants. The segregating plants could be divided into three groups according to the percentage of *di* plants that they produced. The winter growth type of plant was not winterhardy.

77. **Dietz, S. M., and Murphy, H. C.** **633.16–2.42–1.521.6:575**
Inheritance of resistance to *Erysiphe graminis hordei, p.f. IV.* (Abst.)
Phytopathology, 1930, **20**, pp. 119–20.

There was single dominant factor for resistance ; the response of 93 pure lines and 4 crosses was determined.

78. **Reed, G. M.** **633.17:575.12**
A new method of production and detecting sorghum hybrids.
J. Hered., 1930, **21**, pp. 133–44.

Parents differing in colour were selected and carefully bagged, and the pollen of one shaken into the other. Among the seedlings, hybrid plants were detected by their dominant colour. Hybrid vigour was pronounced in the hybrid seedlings and seedling colour proved to be inherited on a one factor basis. Resistance to covered kernel smut was governed by one dominant factor in one case, recessive in another.

79. **Karper, R. E.** **633.174:575.14:575.113.7**
The effect of a single gene upon development in the heterozygote in sorghum.
J. Hered., 1930, **21**, pp. 187–92.

A single gene mutation for chlorophyll deficiency (albino) in a homozygous line. The presence of the character in heterozygous condition produced no significant difference from the normal.

80. **Jones, J. W.** **633.18:575.113.4.061.6**
Inheritance of anthocyan pigmentation in rice.
J. Agric. Res., 1930, **40**, pp. 1105–28.

Three factors were involved in giving purple colour, and four separate "linkage groups" established for groups of organs which inherited colour together from the same factor.

The colour of leaves and leaf sheaths (deviations from three factor ratio), of awns (two or one factor differences), of apiculi and apex of lemma and palea (one or two factor differences), or internodes, glumes and stigmas (three factors), of nodes, ligules, auricles and pulvini (two and three factor differences), of seed coat (one factor difference) were studied. No colour developed without factor *C*, and purple required two or more factors for its development.

81. **Crebert, H.** **633.3:575.12**

Beitrage zur Kreuzungstechnik der Leguminosen. (Contribution to the technique of hybridization for Leguminosae.)
Der Züchter, 1930, **2**, pp. 85–87.

A minimum damage to the flower and abundant water supply are the first requisites. By growing the plants in pots, it is possible, by appropriate treatment, to adjust the time of flowering of the two parents. At the time of flowering, the mother plant should be in not too dry an atmosphere. The time for removal of the stamens is when one-third of the length of the petals is still enclosed by the sepals. These should not be entirely removed on opening the flower. Broad beans, white lupins and peas are ready when the green colour is just changing to white, blue lupins when the dark, reddish-blue changes to light blue.

In opening the flower, care must be taken not to tear apart the two halves of the keel petal. To effect pollination the standard and wing petals of the male flowers are removed and the tip cut off the keel petal containing the stamens. This forms a kind of bag inside which the pollen is inserted into the female flower.

82. **Samson, S.** **633.42:575.11**

Le *Brassica oleracea*. Quelques caractères héréditaires du *Brassica oleracea*. (*Brassica oleracea*. Some hereditary characters of *Brassica oleracea*.)
Rev. Inst. Agr. d'Oka, 1930, **4**, pp. 92–95.

83. **Huber, J. A.** **633.491:575**

Genetische Versuche mit Salatkartoffeln. (Genetic experiments with culinary potatoes.)
Z. Züchtung, 1930, A. **15**, pp. 75–85.

I. In the progeny from self-pollination of " Wurtemberger Wurstkartoffel," the following characters were studied :—

Colour of skin. This was not very dark red in the parent; the offspring contained 11 of the same colour, 12 light red, 3 pale pink and 12 white. Grouping the pale pinks with the whites, the relation 23 coloured : 15 white conforms to 9 : 7 expected on Salaman's 2 complementary factor basis, the parent being heterozygous, thus : *Rr-Dd*. The colour in each clone shows a certain amount of variation.

Form of tuber. Round and long, straight and curved appeared, the parent being long and curved. Of 38 individuals, 2 were round, 3 round-oval and 33 long; of these, 15 were more or less curved. Assuming 3 polymeric factors, 2 of which are dominant for long, these results agree with the expected 33·9 long : 4·1 round. For an analysis of the other shape factors, the numbers were not large enough.

Flesh colour. 20 yellow, 11 light yellow, 7 white, or 31 : 7. Assuming two factors, of which one can give yellow only in the homozygous condition, the expected ratio is 21·4 : 9·5 : 7·1 or 30·9 : 7·1. A bud mutation for red flesh occurred.

Position of eyes. 17 deep or intermediate deep, 21 shallow, *i.e.* two complementary factors, both of which must be present to produce shallow eyes, with an expected ratio of 7 : 9.

The numbers were too small to detect linkages. Variations were observed also in habit of growth, leaf colour, flower colour and length of vegetation period.

II. *Blaue Tannenzapfen* on selfing proved to be highly heterozygous, giving great variation in skin colour, form of tuber and flesh colour, a point of interest being the occurrence of yellow forms from the white-fleshed parent. One clone evidently developed by parthenocarpy.

III. *Frühe Rosen* x *Blaue Tannenzapfen*. Both parents had coloured skin and white flesh, differing in shape of tuber.

Skin colour. 9 blue, 6 red, 1 white, some clones being flecked. Thus, too many genes are present for analysis of these figures.
Form of tuber. 13 long, 3 round, corresponding to a 3 : 1 ratio.
Flesh colour. 3 yellow, 5 light yellow, 8 white, indicating the presence of two factors.
Eyes. 11 deep, 4 intermediate, 1 shallow, indicating two factors.
There was splitting also of flower colour and other characters.

84. **Rybin, W. A.** **633.491:576.312.35:576.16**
Karyologische Untersuchungen an einigen wilden und einheimischen kultivierten Kartoffeln Amerikas. (Cytological investigations on some wild and indigenous cultivated potatoes of America.)
Z. indukt. Abstamm.—u. Vererb Lehre., 1930, **53**, pp. 313–54.
Certain wild forms growing as weeds in South America have the same chromosome number and similar centre of distribution as the cultivated forms. These are thought to be the progenitors of the cultivated potato, rather than those which have hitherto been regarded as " related " forms, which agree neither in distribution nor chromosome number.

85. **McKay, J. W., and Goodspeed, T. H.** **633.51:575.243:581.035.4**
The effects of X-Radiation on cotton.
Science, 1930, **71**, p. 664.
As a result of treating the anthers with X-rays, the set of seed was greatly reduced : the plants obtained showed various deformities. Three plants produced abnormally large and others naked seeds.

86. **Kappert, H.** **633.52:575.115.061.6**
Ueber den Rezessivenausfall in den Kreuzungen gewisser blau- und weissblühender Leinsippen. (On the loss of the recessive on crossing blue and white flowered strains of flax.)
Z. indukt. Abstamm.—u. Vererb Lehre., 1930, **53**, pp. 38–66.
Tammes explained the low numbers of white plants by zygote elimination. The author found the phenomenon in certain crosses, but not in others ; it was explained by incompatibility of certain gene combinations.
A large number of plants from certain crosses was grown. The seedlings with the *B* factor (blue flowered) were distinguishable by the colour of the hypocotyl on the third day. This colour disappeared again after a few days. The counts were made at this stage. In the cross Stockholm flax x Weimar flax, the deficit of whites was about three times the standard deviation and, in a repetition of the experiment, nine times. When the Weimar parent was replaced by Pskow flax, the segregation was quite normal. Further investigations showed that, in addition to the lack of recessives, there was also a significant lack of heterozygotes.
Germination experiments proved that the low numbers could not result from a different degree of germination of seeds with and without the *B* factor in presence of *C*. An abnormal proportion of white to blue gametes in the female plant explains the case ; *i.e.* the cells in the tetrad which contain *BC* are more vigorous than those with *bc*.
However, the progeny of F_2 plants of the first cross, Stockholm x Weimar, were varied, some families being normal, others having the deficit of recessives. This character itself is shown to be dependent on genetic factors, of which the number is to be determined in further crosses.

87. **Downs, E. E., and Lavis, C. A.** **633.63:581.162.3**
Studies on methods for control of pollination in sugar beets.
J. Amer. Soc. Agron., 1930, **22**, pp. 1–9.
Out-pollination was prevented by isolation of mother plants, by caging mother plants and by enclosing flowering shoots in paper bags. In the caging method no cloth was obtained of such fineness as to prevent the production of seed from foreign pollen. The third method failed completely to produce seed, but the isolation method gave an appreciable quantity of close-fertilized seed.

88. **Goodspeed, T. H.** **633.71:576.356.5:581.035.4**
Occurrence of triploid and tetraploid individuals in X-ray progenies of *Nicotiana tabacum*.
Univ. Calif. Pub. Bot., 1930, **11**, pp. 299–308.

89. **Johnson, J.** **633.71–2.421.1–1.521.6:575**
Breeding tobacco for resistance to Thielavia root rot.
U. S. Dept. Agric. Tech. Bull., **175**, 1930.
The reaction of a number of varieties is given. Resistance proved dominant. Strains more resistant than the parents were obtained. Two strains of commercial importance produced.

90. **Chase, E. M., and Church, C. G.** **634.31:581.192:575**
Inheritance of composition of Washington Navel Oranges of various strains propagated as bud variants.
U.S. Dept. Agric. Tech. Bull., **163**, 1930.
A number of important economic characteristics of 18 strains were shown to be transmitted by vegetative propagation.

91. **East, E. M.** **634.75:575–182**
The origin of the plants of maternal type which occur in connection with interspecific hybridizations.
Proc. Nat. Acad. Sci., 1930, **16**, pp. 377–80.
The following possibilities exist :—
(1) Induced development of diploid eggs,
(2) of adventitious embryos from somatic nucellar tissue,
(3) of haploid eggs with restoration of diploid number later,
(4) selection by a genom of the mother species of a similar genom in the polyploid male nucleus.
The fact that maternals show both the dominant and recessive characters indicated that (3) has been the reason in this case. In another case (4) has been proved to be the case ; a number of the males' dominant characters are exhibited in a maternal plant with 14 chromosomes from a cross of a 14 female x 56 male.

92. **Rieman, G. H.** **635.25–1.521.6:575**
The inheritance of disease resistance in the onion. (Abst.)
Phytopathology, 1930, **20**, pp. 115–16.
Two genes for resistance to smudge.

93. **Walker, J. C.** **635.34–2.484–1.521.6:575**
Inheritance of Fusarium resistance in cabbage.
J. Agric. Res., 1930, **40**, pp. 721–45.
Resistant and susceptible lines have been selected from commercial stock and crossed. Resistance was completely dominant, a single factor pair being shown by selfing, crossing between plants of similar parentage and back-crosses. Nevertheless modifiers seem to be involved in certain partially resistant types. No linkage was indicated between resistance and other desirable characters.

94. **Porter, D. R.** **635.615–1.521.6:575**
Pathogenicity of *Fusarium nivcum* and the resistance of some watermelon hybrids. (Abst.)
Phytopathology, 1930, **20**, p. 116.

95. **Wilson, J. J., and Layton, D. V.** **635.615–1.521.6:575.14**
The resistance of a watermelon genotype to *Fusarium niveum*. (Abst.)
Phytopathology, 1930, **20**, p. 116.
Increased resistance was secured by inbreeding.

96. **Ernst-Schwarzenbach, M.** **635.64:575**
Genetik und Züchtung der Tomate. (Genetics and breeding of Tomato.)
Der Züchter, 1930, **2**, pp. 80–85.
The characters to be aimed at in breeding tomatoes for Germany are : earliness, firm fruit with no tendency to burst, wet-cold resistance, suitability for preserving, low water and seed content ; also low, neat growth, disease resistance, good colour, smooth fruit without ribs and high yielding capacity (only if combined with earliness).
Diploid, tetraploid and triploid forms are now known. The tetraploids are large plants, but the number and size of their fruit is somewhat below that of the diploid, the latter on account of the much smaller number of seeds. The shape is a little irregular and the fruit less juicy. They are very suitable for conserving.
The triploids germinate with more difficulty, otherwise they are intermediate. They are sterile and on crossing diploids mostly result, with sometimes 1–3 extra chromosomes, the latter types coming from the smaller seeds.
Of the 12 different types having one extra chromosome to be expected, 9 have been found. On selfing only from 7–37% of these trisomic individuals are obtained, by back-crossing only 10–33%.
Secondary trisomic individuals are those having a part of a chromosome, as opposed to a whole chromosome, extra. The fruits are often smaller than diploids and often parthenocarpic, or they may have more seedless loculi. They may therefore be valuable for preserving, although they cannot be propagated pure by seed, diploid individuals always occurring in the progeny.
Periclinal chimaeras of tomato and nightshade are almost immune to *Septoria lycopersici*. F1 plants from parents of different origin show considerable hybrid vigour.
Three linkage groups and a character in each of three of the other chromosomes have been established. The genes for fruit form are in the first chromosome : flattened fruits are dominant to round, and these to egg-shaped. The latter gene is strongly linked with dwarfness and peach-like skin. Colour of flesh, of skin and leaf forms are independent and therefore in different chromosomes. Different degrees of crossing over have led to the mapping of the linked genes. Size of fruit is dependent on multiple factors of which one is linked with the factors in the first chromosome, others with the third and second chromosome groups.

97. **Stewart, R. T.** **635.655:575.11.061.6**
Inheritance of certain seed-coat colors in soy-beans.
J. Agric. Res., 1930, **40**, pp. 829–54.
This is the chief character by which the strains of soybeans are identified.
Pigment in the hilum was governed by the factors which govern seed-coat colour. Seed-coat colour was governed by a series of three multiple allelomorphs, different combinations of which gave black, imperfect black, light brown, reddish-brown, and buff. A further factor inhibited the development of pigment in the seed-coat, but not in the hilum. A factor pair governing tawny v. grey pubescence is completely linked with one of the colour factors. A further factor, " eyebrow-colour pattern " affects the distribution of the pigment and is allelomorphic with the other distribution factors. The factorial explanation offers an explanation of all the results of the author and those previously reported by other workers.

98. **Veatch, C.** **635.655:575.125**
Vigor in soybeans as affected by hybridity.
J. Amer. Soc. Agron., 1930, **22**, pp. 289–310.
The F1 hybrids between a number of strains almost all gave higher yields than the average of the parents : 10 gave higher yields than the higher yielding parent, and the average yield of the hybrids was 19.55% greater than the average of the higher parents.

The number of seeds per plant was increased, but to a less extent than the yield. The seed weight was also greater than the average of the parents; also the number of pods per plant, number of seeds per pod, and number of nodes.
Hybrid vigour was shown in the plant height and weight, in the proportion of seed to straw and later time of maturity. The increase in the number of parts was greater than the increase in the size of the parts.
The F_2 showed transgressive segregation, the variation being greater than that in the parents in the case of yield, number of seeds per plant (particularly), height of plant and time of flowering, the average of the F_2's being later than the average of their parents.
The average for F_2 mostly came between the averages of the two parents, but some segregates were more vigorous.
The hybrid vigour is explained by the presence of a number of partially dominant growth factors, different ones being supplied by different parents, giving the possibility of securing segregates in F_2 which are pure for a greater number than are present in either parent.
The best criteria for hybrid vigour were yield of seed, number of seeds, plant weight and total stem weight.

99. **Veatch, C.** **635.655–1.557:575.116.1**
Vigor in soybeans in relation to inhibition of pubescence.
J. Amer. Soc. Agron., **1930**, **22**, pp. 446–52.
For many characters the F_1 plants were below the average of the two parents. In F_2 the glabrous segregates were all low in yield and vigour, like the glabrous parents, whilst the pubescent segregates out-yielded the pubescent parents. The range of yield was greater in F_2 than in the parents. Number of seeds per plant and plant height showed similar behaviour and even greater variation. These facts indicate that certain growth factors contributed by the glabrous parent were different from those in the pubescent parent, but that the factor inhibiting pubescence is closely linked with growth depressing factors, or is itself responsible for the effect.

100. **Boeker, P.** **635.656:575**
Die Züchtung der "grünsamigen" Kronenerbse. (The breeding of the "green seeded" Kronen pea.)
Z. Züchtung, **1930**, A. **15**, pp. 17–29.
The "Kronen" pea has all its flowers close together at the top of a strong stem, and its relatively short flowering period is of practical value in reducing the possibility of attack by injurious organisms. On account of the yellow colour of the seeds, it is not much used.
The attempt was therefore made to produce a "Kronen" pea with green seeds by crossing with a green seeded variety. The F_1 seed colour was intermediate. In F_2 the plants segregated for height, seed colour and yield, and among them tall and short green seeded plants of the "Kronen" type were produced, with higher yield than the parents. The tall plant yielded better than the short. The seed colour showed a one factor inheritance with yellow dominant.

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